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Spaces of Innovation: learning, proximity and the ecological turn

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Contrary to the fashionable “death of distance” thesis, the socio-spatial context for innovation remains as important as ever for firms, networks and the public institutions that tend to be neglected in orthodox narratives of learning. In this article we explore the changing socio-spatial dynamics of innovation through the medium of three arguments: (i) that the “learning region” debate was worth having because it triggered a fruitful dialogue between innovation theorists and economic geographers; (ii) that geographical proximity remains central to our understanding of learning and innovation and should not be reduced to, or conflated with, physical co-location; and (iii) that “the ecological turn” challenges conventional conceptions of learning, innovation and development, posing unsettling questions about the forces of path dependency, especially in less favoured regions.

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1. Introduction

The idea of learning regions has been with us since the mid 1990s. After more than a decade it is an opportune moment to reflect on the strengths and the weaknesses of the concept. Not without controversy, and certainly not without ambiguity, the idea of learning regions has generated debate way beyond academic circles, having engaged various policy circles around the world. We take this opportunity to examine the main contours of that debate and consider why it resonated so strongly. The paper also asks whether the concept is sufficiently robust to meet the new challenges of local and regional development in the shadow of climate change.

We begin the paper with a retrospective review of the debate in section two, where we reflect upon the origins of the concept of the learning region before briefly considering the reasons for its resonance and the validity of some of the criticisms levelled at it. In section three we aim to restate the significance of geographical proximity in the learning process, a theme which lies at the heart of the learning region debate. To address this theme we draw on three vignettes of social learning, namely – knowledge formation, venture capital activity, and the university as a spatial ecology.

Where sections two and three take a retrospective view of the debate, section four uses the prism of the ecological turn to speculate about future trajectories of learning, innovation and development. Here we suggest that the learning region debate has been largely confined to narrowly conceived narratives of development that are predicated on economic innovation and skewed towards intra-regional learning, so much so that there is a need for research which broadens the terms of this debate. Through our vignettes we suggest that this research urgently needs to consider three dimensions: firstly, the applicability of the concept to wider notions of innovation, particularly with respect to social and environmental concerns; secondly, the relationship between inter and intra-regional

learning processes needs to be examined through more robust, empirically-grounded studies; and, thirdly, the role of regional governance as a potentially important facilitator in the learning process needs to be more critically examined, especially as regards the prospects for learning and innovation within the public sector because less favoured regions tend to be the most state-centric and path dependent regions.

2. The Learning Region debate: origins, resonance and lessons

The term 'learning regions' was originally coined by Richard Florida in 1995 when, in a provocative essay, he argued that in a global knowledge economy, regions were increasingly the focal point for knowledge and learning (Florida 1995). Florida's notion of a region, though, was of a very different scale to that of most subsequent authors writing in this field. Thus, from its very genesis, there has been ambiguity surrounding one of the key features of the concept.

The concept of the learning region is one of a suite of concepts which consider the territorial dimensions to innovation (Moulaert and Sekia 2003), others include industrial districts and regional innovation systems. Whilst there has been some discussion of the distinctions to be drawn between these different concepts this is something of an artificial exercise. It is better, perhaps, to view them as complementary but offering slightly different perspectives. All three are concerned with the institutional foundations of regional competitive advantage, with work on industrial districts arguably taking a bottom-up perspective whilst that relating to regional innovation systems is more structural, where the main focus is on the interaction of and between system components (Hassink and Lagendijk 2001). The notion of the learning region can be seen to build on each of these concepts, being based around the industrial configuration of the territory, particularly levels of agglomeration; the extant infrastructures for knowledge generation and innovation and, most significantly, the prevailing cultures and institutions which shape the learning process (Malmberg 1997). Crucially, what is made explicit in the notion of the learning region is the importance of the reflexive learning process and the extent to which regional institutions both engage with and facilitate this.

The importance of a capacity and capability for continuous learning and innovation is now widely accepted as a key component in sustaining the competitive advantage of a firm (Amin and Cohendet 2004). Indeed, for many authors, the modern economy is now fundamentally based around value creation through knowledge and learning, as epitomised by Lundvall and Johnson's description of it as a 'learning economy' (Lundvall and Johnson, 1994). This focus on learning and knowledge has spawned a corpus of literature which examines the role of firm-level structures, inter-firm linkages and national institutional contexts in influencing how knowledge is generated, combined, used and diffused in pursuit of innovation (see for example Amin and Cohendet 2004).

The notion of the learning region injects a regional dimension to this understanding and argues that the region is a key locus for knowledge generation; is the repository for knowledge, and provides the underlying environment shaping the flow of knowledge, ideas and learning (Florida 1995, Morgan 1997). Innovation, it is argued, is an interactive process which is shaped by a variety of institutional routines and social conventions. These routines and conventions vary, temporally and geographically, with some forms being more conducive to fostering innovation and learning than others (Morgan 1997). The capacity of a region to support a collective process of learning and innovation through the absorption and diffusion of knowledge adapted to local needs is thus regarded as a key source of

competitive advantage to firms within that region, and to the sustained economic prosperity of the region itself (Iammarino 2005, Lawson and Lorenz 1998, MacKinnon et al 2002).

In seeking to explain the importance of the regional scale, we need to move beyond the truism that regions are the places where knowledge generating firms and organisations are located. Whilst an effective knowledge infrastructure can, undoubtedly, support levels of innovation within a region, the learning region concept suggests that we need to look to other factors to explain why this might be significant. Three characteristics are commonly highlighted.

Firstly, the role of *tacit knowledge* in the innovation process suggests that geographical proximity can play an important role in promoting strong innovation performance. Unlike codified knowledge, tacit knowledge largely depends upon interpersonal interactions and so has been described as being spatially ‘sticky’ (Morgan 2004a). The presence of networks and untraded interdependencies (Storper 1995) between companies and organisation, which facilitate such personal interactions, can play a significant role in facilitating the diffusion and combination of knowledge in ways that stimulate innovation (Granovetter 1973). There is also quite extensive evidence to think that knowledge spillovers tend to be locally concentrated and that they decline with distance, although the precise spatial range remains contested (Döring and Schellenbach 2004).

Secondly, the *institutional contexts* which play such a crucial role in mediating the flow and use of knowledge, through the sharing of information between parties for example, tend to be regionally-contingent. Differential levels of trust, social capital and institutional thickness have all been highlighted in the learning regions literature as factors influencing comparative levels of innovation performance. Regions with stronger endowments of those social conventions conducive to fostering innovation will, the argument goes, be more likely to achieve economic success than those where such cultural endowments are weaker (Morgan 1997).

Finally, and perhaps most significantly, the learning regions concept brings the role of *organisational structures*, such as governmental bodies and economic development agencies into sharp relief, particularly their role in shaping the institutional context prevailing within a region (Hassink and Lagendijk 2001). As Hudson (1999) argues, “institutional thickness” need not be a progressive force for change but can, just as easily, act as a sclerotic force locking regions in to outmoded development trajectories and so constraining opportunities for adaptation and innovation. A learning region requires regional actors capable of learning in their own right and able to reflect in a critical way on their own institutional arrangements and the extent to which these remain appropriate to changing economic contexts (Hassink and Lagendijk 2001). More especially, it requires the ability to ‘unlearn’, or forget, old routines when introducing new ones.

Taking these points together, learning regions are “characterised by regional institutions which facilitate individual and organisational learning through the coordination of flexible networks of economic and political agents” (OECD 2001:24) and “provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning” (Florida 1995:528). They are “places which foster social learning processes amongst firms, between firms and other local organisations and reflexive learning by local and regional economic development agencies in the public and quasi-public sectors” (Gertler 2001 p.13). In short a learning region not only supports an environment conducive to learning by all key players, but also contains organisations and institutions which actively work to promote such learning through a sustained process of reflexive and adaptive learning themselves. As such, it is not geographical proximity *per se* which produces productive knowledge spillovers, but other forms of social and institutional proximity (Iammarino 2005).

The learning region thus incorporates four key dimensions. It is the locus of a network of successfully learning firms; it is the source of a rich network of learning activity between firms and other organisations; it possesses a set of socio-cultural institutions which facilitate learning, and it contains a set of reflexive regional actors which are themselves able to learn and adapt so as to avoid becoming locked in to old modes of production. It is perhaps no wonder that the learning region has been described as an 'ideal type' or that the OECD states that "it is not possible to identify examples of actually existing 'learning regions'" (OECD 2001, p.24). Yet, despite this, the concept of the learning region has undoubtedly had a significant impact. It has spawned a large academic literature and has also generated intense interest amongst policy-makers and strategists (see for example Hassink 2005). The question is why did it resonate so?

Why did the concept resonate?

The basic tenet of the learning region concept - that territory, and more particularly the region, matters – is a compelling one. In many respects, as Gertler (2001) acknowledges, it is not surprising that it captured the imagination of policy makers. Not only does it stress the importance of what he terms 'high-road strategies' of supporting innovation and competitiveness as a route to regional economic development, it also stresses a strong role for regional institutions and policy-makers. The attention drawn to the concept by publications such as that of the OECD (2001) and national strategies have also played a crucial role in this regard (See Hassink 2005). Such has been the attention given to the concept, that it led one observer to comment that "concepts of learning regions ... have attained hegemonic status within contemporary regional development discourses" (MacKinnon et al 2002 p.296).

That the concept travelled easily from academic circles to policy circles was clearly one reason why it disseminated so rapidly (Hassink and Lagendijk 2001). Moreover, as Hassink and Lagendijk recognise, the fact that it was able to offer tangible policy prescriptions, concerning so-called 'best practice' for example, made it especially attractive to policy-makers. Policy-makers in old industrial regions were also attracted by the idea that the learning region concept was as applicable to less favoured regions as it was to prosperous regions.

The learning region concept co-evolved, not coincidentally, with a growing emphasis on the knowledge economy and the role of innovation in sustaining economic resilience. The suggestion that regions might improve their economic performance through stimulating more conducive institutional conditions for innovation is a remarkably powerful one, especially if we consider that all firms are embedded in an institutional matrix of one form or another (Gertler 2001). That this 'learning turn' coincided with a 'territorial turn' in economic geography only added to the pertinence of the concept. For many writers, the territorial dimension to innovation remains one of the crucial research agendas of our time and, here especially, the learning regions concept played a genuinely useful role because it helped to foster a more creative dialogue between innovation studies and economic geography in the context of an explicitly evolutionary framework of analysis. The growth of *evolutionary economic geography* is now one of the most exciting branches of innovation studies (Boschma, 2009; Boschma and Martin, 2010).

Moreover, the territorial turn in the academic literature reflects the increasing attention being given to the regional scale in policy circles. Over the past two decades there has been a resurgence in the roles and responsibilities ascribed to the regional scale, particularly in the context of a globalizing knowledge economy (Florida 1995). Indeed, this was one of the starting points in Florida's early

exposition of the idea of learning regions whereby the nation state was (wrongly) seen as less relevant than in the past. In practice, regions are also being viewed by policy-makers in a stronger light, particularly in the European Union, where they are seen as central to the drive to achieve social and economic cohesion across the EU.

Another, less positive, reason why the concept resonated so strongly may be due to its very ambiguity. As a term it can serve many masters and this is doubtless one reason for its popularity, both in academic and policy circles. Yet this also leaves it open to the charge that it lacks substantive clarity. Various described as ‘fuzzy’ (Markussen 1999) and, more critically, as one of several “vague and impressionistic neologisms” (Martin 2001), the learning region concept is charged with lacking empirical validation. Other criticisms levelled at the concept include its strongly normative bias, though normativity per se need not be a fatal weakness as we shall see later. Ten years on, then, it is perhaps opportune to examine these criticisms and assess their validity.

What can we learn from the Learning Region debate?

The substantive challenge

That the early conceptualisation of the learning region was rather nebulous, or fuzzy, is now widely accepted, though in some cases it was used more as a metaphor than a concept (Morgan, 1997). But this very fuzziness may have bestowed early benefits in that it opened “up the conceptual terrain for discussion and deliberation” (Grabher and Hassink 2003 p.700). Since the launching of the concept, there has been a wide range of research seeking to understand the characteristics of a ‘learning region’ and the role and nature of the learning process within a region. This has produced a large corpus of literature which addresses the interplay of learning and innovation. Yet, as we suggested at the outset, this literature approaches the concept from very different perspectives and remains largely disjointed, with three significant strands of activity visible: that which considers learning and innovation per se; that which considers the role of geographical proximity in innovation; and that which considers wider regional development processes and the policy implications. If the value of the concept is the momentum that it has given to an exploration of the relationship between the territorial and corporate bases of knowledge production, and the use of that knowledge in stimulating innovation and economic development, the weakness remains the fractured and narrow nature of the debate (Hudson, 2003).

Perhaps the more damning assessment of the concept, however, has been a lack of conceptual clarity in the interpretation of what constitutes a ‘region’, whereby the term ‘region’ is used, seemingly arbitrarily, to refer to widely contrasting spatial scales (Lovering 1999, McLeod 2001). Drawing on the work of Kenichi Ohmae, Florida identifies a ‘learning region’ as a natural economic zone, which may cross national boundaries, whose primary linkages are with the global economy and not the host nations (Florida 1995). In contrast to this idiosyncratic conception, most of the literature on learning regions actually focused upon regions in the form of sub-national administrative entities, drawing on insights from the field of regional innovation systems (see Cooke 1998). A further problem of research undertaken under the learning regions banner has been a “tendency to take the foundational concept of the region for granted” (Mackinnon et al 2002:297), rather than to adequately consider the institutional forms which distinguish the nature of the sub-national ‘regional’ unit in different countries. This lack of precision in terms of comparable scale and institutional context has rightly been criticised as debasing the explanatory purchase of the concept. Recognizing the validity of this criticism, however, does not necessarily mean that we have to abandon the concept itself.

Where there is less ground for complacency is the occasional tendency to ascribe casual powers to the territorial space itself (MacKinnon et al 2002). This spatial fetishism (Morgan 2004b) fails to recognise that territories – be they locales, regions, nations or some other formation - derive their roles and identities from the mix of activities present within their boundaries (Lagendijk and Oinas 2005, Amin and Thrift 2002). It is not the territory which has agency, but the combined force of the individuals and organisations which exert influence in any particular place and the institutional norms which govern their interaction. This places an onus on institutions to take charge of their own destiny and, we argue, places an important duty on the governance structures of a region to facilitate effective learning processes where these might otherwise be lacking.

The evidential challenge

A lack of empirical evidence in support of the assertions made for the role of socio-institutional conditions in stimulating learning, innovation and economic development at a regional level has certainly been one of the weak points of the learning region literature. Until recently, most of the evidential base has been dependent on individual case studies reinforcing the early claim that the fairly elaborate theoretical accounts suffered from limited empirical validation (Malmberg, 1997). However, a small number of significant studies is beginning to take up the challenge and the early signs are encouraging for advocates of the concept, demonstrating that “the economic potential of a region is maximised when an appropriate set of social conditions is combined with local investment in R&D” (Rodriguez-Pose and Crescenzi 2008a:61).

In their work, Rodriguez-Pose and Crescenzi (2008a) show how the innovation capacity of a region is shaped by a complex interaction between local and external research shaped by local and non-local socio-economic and institutional conditions. The important role played in this complex process by socio-institutional factors is demonstrated empirically by the work of Hauser et al (2007), as well as by Rodriguez-Pose and Crescenzi (2008a). In their work, Hauser et al demonstrate that the impact of social capital on regional innovation processes is significant, and comparable with the importance of human capital, finding strong evidence for the significance of weak ties in innovation activity. Interestingly, their work demonstrates that whilst conditions of trust and norms of civic cooperation are often highlighted in the learning regions literature, the more significant dimension of social capital for innovation activity is the level of ‘associational activity’, which refers to the capacity to collaborate for mutually beneficial ends (Cooke and Morgan, 2000). Similarly, Rodriguez-Pose and Crescenzi (2008a) identify the role of ‘social filters’ in influencing levels of innovation activity, with Rodriguez-Pose having previously described these as the unique “combination of elements that favour or deter the development of successful regional innovation systems” (Rodriguez-Pose 1999:82). They further demonstrate that “a good social filter increases the potential of EU regions to assimilate spillovers, making local R&D expenditure irrelevant” (Rodriguez-Pose and Crescenzi 2008a:60). One of the most powerful conclusions of the work of Rodriguez-Pose and Crescenzi is that investing in R&D is no guarantee of achieving greater economic growth owing to the importance of social conditions. In their work the social filter is always positively associated with economic growth and is always statistically significant.

The normative challenge

The third major critique of the concept – that it is excessively normative in its approach – is neatly summarised by the OECD when it describes the learning region as a ‘model’ to which all regions need to progress (OECD 2001:24). Indeed, the very foundations of the learning region are rooted in a normative standpoint, with Florida proclaiming in his original paper that regions “must in effect

become learning regions” (Florida 1995:532). While such normativity is often portrayed as a weakness, because it supposedly implies a lack of rigour and objectivity, it can also be seen as a strength, not least because it renders explicit the rationale as to why something really matters, and this inevitably entails a normative dimension. Indeed, the attractiveness of the learning region concept to policy makers was attributable to the fact that it was seen as a desirable and aspirational route to economic growth, and exemplars of good practice from other regions played a role in this process, helping policy-makers to learn from others as opposed to crudely trying to clone them. In the context of the ecological turn, which we discuss in section four, the intellectual climate is slowly but surely shifting towards a greater acceptance of normativity in theory, policy and practice. The notion that values and ends are beyond the scope of human reason is increasingly being challenged in social theory and moral philosophy because they are deemed to be essential to the debate about what conditions and capabilities we need to live well. At a time when the very notion of development-as-progress is under threat – particularly from climate change, international recession and burgeoning world hunger – it is more important than ever to question the ends as well as the means of development through a critical and reflexive process of normative reasoning (Sayer, 2010).

Even so, while it is right to include normativity in policy-relevant research, the fact remains that the learning region concept is becoming less normative as the empirical base improves. From the evidence cited above, it seems that there is more to the concept than simply a normative ideal to which regions should aspire. Indeed, it is increasingly apparent that strong norms of collective, and reflexive, learning do provide tangible economic benefits to regional growth prospects, a point endorsed by evolutionary economic geographers (Boschma and Martin, 2009).

3. Spaces of innovation: why (geographical) proximity (still) matters

One of the most ubiquitous notions of recent years, a notion that is especially prevalent in the business school literature, is that the forces of globalization spell the ‘death of distance’ and the ‘end of geography’ (Martin, 1996; Cairncross, 1997). In more popular accounts, these forces – like the expansion of world trade, the internationalization of firms, the growth of outsourcing, the distance-shrinking effect of digital technologies for example – have persuaded some writers that globalization is having a levelling effect on the landscape of the world economy, driving one of them to conclude that ‘the world is flat’ (Friedman, 2005). It is in this context that the concept of geographical proximity, a basic axiom of economic geography, is being challenged.

We aim to contest this fashionable view by arguing that geographical proximity (which should not be reduced to mere physical co-location) retains a powerful analytical capacity to explain uneven economic development, the quintessential geographical feature of capitalism. To address this aim we focus on three significant dimensions of innovation, namely:

- (i) the socio-spatial dynamics of learning and knowledge formation;
- (ii) the spatial stickiness of venture capital, which helps to commercialise new technological knowledge; and
- (iii) the spatial ecology of the university sector, one of the pillars of the knowledge economy.

Drawing on some key debates in each of these three fields, we shall argue that geographical proximity still matters even if it needs to be complemented by other forms of relational proximity.

Learning and Knowledge Formation: the exaggerated death of geographical proximity

Although they may differ in other respects, most theories of economic geography over the past fifty years have attached enormous significance to the concept of geographical proximity. From Gunnar Myrdal's theory of cumulative causation in the 1950s, which sought to explain the spatial dynamics of uneven regional development, to the 'new' economic geography of Paul Krugman, where a combination of scale economies, specialization and falling transport costs is used to explain the growth of urban areas, there has been a strong presumption that these dynamic agglomerations were positively correlated with learning, innovation and productivity (Myrdal, 1958; Krugman, 1991).

The economic benefits associated with localization and urbanization economies are deemed to be particularly important in knowledge-intensive sectors, which remain strongly agglomerated throughout the world despite falling transport costs and the spread of distance-shrinking digital technologies (World Bank, 2009). One of the main reasons why knowledge-intensive sectors exhibit this counter-intuitive agglomerative character is because of the high premium attached to face-to-face (F2F) contact, which is especially important where the activity in question is complex, novel and not easily codified (Storper and Leamer, 2001; Gertler, 2003).

F2F contact is deemed to be 'the most fundamental aspect of proximity' according to Storper and Venables, who argue that it confers four distinct benefits: (i) it is an efficient communications technology (ii) it allows actors to align commitments and thereby reduces incentive problems in uncertain environments (iii) it facilitates screening and socialization and (iv) it provides psychological motivation (Storper and Venables, 2004).

However efficient it is as a technology of transaction, F2F is costly because it is so time-consuming. Because we cannot engage in F2F transactions with everyone, we need to screen out the people with whom we wish to interact and informal social networks help us to do so. According to Storper and Venables, these social networks assume distinct spatial forms:

'In some internationalised professions – such as academia – this does not always require co-location, although is certainly reinforced by F2F in the conference circuit. In other activities these information networks can only be maintained within a restricted geographical area. In such fields as fashion, public relations, and many of the arts (including cinema, television, and radio) there are international networks "at the top", but in the middle of these professions networks are highly localised, change rapidly, and information used by members to stay in the loop is highly context-dependent. In parts of the financial services and high technology industries, local networks intersect with long-distance contact systems. In almost anything relating to business-government relations, networks have a strongly national and regional cast' (Storper and Venables, 2004: 11)

The combined effect of the four benefits of F2F is called 'buzz' because, according to this view, there is a superadditivity in these effects, generating increasing returns for the people and the activities involved. To be able to reap these benefits in full, they say, 'almost invariably requires co-location, rather than occasional interludes of F2F contact'.

The foregoing analysis builds on and chimes with a large literature – in the cognate fields of learning, knowledge formation, know-how transfer, innovation management, networked organizations, and evolutionary economic geography among others – that underscores the social significance of geographical proximity even in the knowledge-intensive districts that specialise in distance-shrinking technology. On this point we cannot do better than recall Brown and Duguid's analysis of the 'ecologies of knowledge' that lie at the heart of advanced technology clusters:

'For the ecology to flourish, however, it evidently needs not just a range of capabilities, but a close range...This close proximity not only shows how to attack a particular niche, it provides the ability to see a niche before it is visible to most eyes...Density of firms, practices, and practitioners also promotes reliable risk- and trust-assessment...So distance is far from dead, even where distance technology is at its most advanced' (Brown and Duguid, 2000:168-169).

The key point of this argument for our purposes is that it effectively disposes of the 'death of distance' thesis by highlighting the multiple benefits that are associated with 'close proximity' in the very heartlands of the knowledge economy. If the crude theories of modern 'flat earthers' can be safely discounted, the same cannot be said of the more sophisticated critics of geographical proximity. Here we would single out the recent work of Ash Amin and Patrick Cohendet, who have mounted the most significant, as well as the most stimulating, challenge to the orthodox view of geographical proximity in the social sciences (Amin and Cohendet, 2004).

Whilst affirming the idea that space lies at the heart of knowledge formation, Amin and Cohendet seek to appeal to 'an extended geographical imagination' where they take issue not with geography per se, but with 'the kind of geography that is mobilised to grasp the spaces of knowing (incorporating innovation and learning) within businesses' (Amin and Cohendet, 2004: 92). In developing an alternative spatial ontology, based on a distanced sociology of learning, they argue that *relational* proximity involves much more than 'being there' in terms of physical proximity. They formulate the crux of their argument in the following way:

'Crucially, if the sociology of learning is not reducible to territorial ties, there is no compelling reason to assume that 'community' implies spatially contiguous community, or that local ties are stronger than interaction at a distance...These distanced ties and the organizational architectures and infrastructures that support them are highly significant knowledge spaces, involving forms of learning and a unity of tacit and codified knowledge that cannot be described as inferior or radically different from the putative powers of face-to-face presence and spatial proximity' (Amin and Cohendet, 2004: 93).

Bold and stimulating as it is, this argument raises as many questions as it answers and it is problematical in four respects (Morgan, 2004a; Gertler, 2008). First, it reproduces the conventional distinction between geographical and relational proximity, a binary that ignores the crucially important point that a relational dimension has to be actively constructed in both forms of proximity because mere physical proximity (that is, spatial co-location without social interaction) does not

constitute any form of community and it certainly cannot be identified with geographical proximity, which entails spatial co-location *and* social interaction. Far from being a purely academic matter, the failure to distinguish between geographical and physical proximity can lead to highly problematical policies. For example, the architects of EU regional innovation policy are wholly wrong to assume that there is a 'natural solidarity' between actors at the regional scale simply because they happen to be physically co-located in the same regional space. On the contrary, local social ties have to be actively constructed rather than assumed to arise automatically, which means that geographical proximity must necessarily include a relational dimension (Cooke and Morgan, 1998; Morgan, 2004a; Boschma, 2005).

The second problem is an over-exaggerated sense of what can be accomplished at a distance, whether it is through the virtual proximity of digital technology or the multiple repertoires of travel, meetings, conferences and other out-of-office activities. Although there are mechanisms for transferring tacit knowledge across organizational and national borders (like spatially mobile communities of practice for example), such distanced mechanisms do not offer the same scope for reciprocity, trust, understanding and serendipity that is afforded by sustained F2F contact, a point that is treated as axiomatic by researchers who are highly attuned to the socio-spatial dynamics of knowledge formation in and between firms (Brown and Duguid, 2000). To the extent that spatially mobile communities of practice are intra-firm communities, their learning opportunities would appear to be narrower and more circumscribed than the opportunities on offer in the ecologies of knowledge that characterise advanced urban and regional clusters (Brown and Duguid, 2000; Storper and Venables, 2004).

Thirdly, if the potential of distanced learning was as compelling as its sponsors claim, if it really was as rich and as powerful a transaction technology as sustained F2F contact in other words, knowledge-intensive sectors would be less inclined to agglomerate in core cities and regions? (Rodriguez-Pose and R. Crescenzi, 2008b). Admittedly, advanced urban and regional clusters are not island economies or technological autarkies sufficient unto themselves; on the contrary, one of the key questions here is how these 'localized learning and knowledge networks are evolving into complex ecologies composed of different organizations that straddle multiple spatial scales' (Morgan, 2004a:13). Economic geographers have come to recognise that, even in the most advanced regional clusters, knowledge creation is shaped by a complex amalgam of learning from near and far, secured through a combination of 'local buzz' and 'global pipelines' (Bathelt et al, 2004; Boschma, 2004).

A fourth problem with the distanced learning argument is that it consists of a set of logical assertions that have yet to be theoretically elaborated and empirically substantiated (Gertler, 2008). To overcome these problems, Gertler proposes a series of key questions that could steer the proximity debate in a less polarized and more productive direction. Under what circumstances, for example, will relational proximity be stronger or weaker? What are the conditions that facilitate long-distance circulation of knowledge, or its joint production by distanced actors? And, perhaps most crucially, what are the prospects for benefiting from 'buzz', which is normally associated with regular F2F contact, without 'being there'? (Gertler, 2008).

Gertler offers useful answers to his own questions by suggesting that the prospects for distanced learning will depend in particular on two sets of conditions, namely: the *social affinities* at the individual, organizational, industrial, and institutional scales and the *type of knowledge* involved in the process, which can be more or less tacit, more or less context dependent. Furthermore, this analysis also identifies an important 'lifecycle' dimension to spatially distributed communities of practice, where they are often launched through intensive F2F interaction and sustained over time

through travel and digital technologies, which confirms rather than contradicts the distanced learning arguments of Amin and Cohendet. While Gertler's analysis has helped to 'open up the black box of relational proximity', it also 'confirms the ongoing significance of spatially proximate, face-to-face interaction' (Gertler, 2008:15).

Neither wholly localised nor purely distanced, learning and knowledge networks straddle multiple spatial scales and the most judicious mix will always remain an empirical question. Whatever the spatial mix though, the deep sociological truth from the literature on 'collaborative communities' is that innovation can only be secured when the innovators are 'loosely coupled', that is when the partners are 'intimate enough to learn from nuance, but detached enough to break with convention and the habits of the group' (Sabel, 2006:116).

Financing innovation: the spatial stickiness of venture capital

Although technological learning looms large in the landscape of innovation studies, it counts for nothing if it cannot be commercialized. Venture capital plays a critically important role in bringing new knowledge to the market, especially when the firms in question are new entrants. The overview of this issue will be much shorter, not because it is less important, but rather because the debate is much less developed than the debate about technological learning. To reprise the key issues here, we draw on the excellent review of the venture capital sector conducted by Colin Mason, who has examined the informal activity of business angels as well as the formal activity of institutional investors (Mason, 2007).

As most business angels (BA) are cashed-out entrepreneurs and high net worth individuals, their location tends to reflect the geographies of enterprise, income and wealth, all of which are decidedly uneven. Many survey-based studies have found a strong distance decay effect in BA investment decisions.

To explain the dominance of short distance investments, Mason suggests there are four fundamental reasons:

- The effect of (physical) distance on an investor's awareness of potential investment opportunities, where most BA's derive their information from informal networks of trusted friends and business associates
- BA's attach great significance to the entrepreneur, and by investing locally they can restrict their investments to people they know or who are known by their associates, and
- The tendency for BA's to be hands-on investors in order to minimise agency risk, a condition that is secured through geographical proximity
- Finally, BA's need to monitor their investments, and this tends to restrict the spatial distance to locations where they can attend and return the same day.

The main exceptions to these trends are the larger investors or those who have industry-specific preferences. Significantly, some BA's will engage in long distance investments if a *local* investor that they know and trust is co-investing with them.

The geographical distribution of formal (ie institutional) venture capital is also spatially skewed to core cities and regions. In the US venture capital investments are highly concentrated at all three spatial scales – regional, state, and metropolitan – with the largest clusters in California, New England and New York. In Canada venture capital investments are concentrated in Ontario and Quebec at the provincial scale and in the Greater Toronto Area, Montreal and Ottawa at the metropolitan scale. The UK displays the same spatially biased tendency, with the geographical distribution favouring London and the South East region. These spatial patterns can be explained, says Mason, in the following way:

‘This strong spatial proximity effect arises because of the absence of publicly available information on new and young businesses. Their unproven business models, untested management teams, new technologies and inchoate markets all represent key sources of risk and uncertainty for investors. Venture capitalists seek to overcome this uncertainty about the future prospects of potential investee businesses by information sharing with other investors, consultants, accountants and a wide range of other actors. Information sharing of this type is built on mutual trust that has been earned through repeated interaction, while the nature of this information flow tends to be personal and informal and therefore hard to conduct over distance’ (Mason, 2007:97).

Mason’s analysis of the spatial dynamics of venture capital also takes in the more recent phenomenon of long distance investing, which tends to underline rather than undermine the clustering effect in core cities and regions. This is because long distance venture capital activity often occurs in the context of the syndication of investments between non-local and local investors. The effect of long distance investing, he argues, is to reinforce the geographical clustering of venture capital investments, rather than producing a more dispersed distribution, because it tends to flow to established areas of high technology, a point confirmed by other studies (Florida and Smith, 1992)

Mason also endorses the important research findings of Matthew Zook, who discovered a *double* clustering effect in the context of the internet industry, where the clustered nature of venture capital finance was itself a locational attraction for new internet firms. Internet entrepreneurs felt obliged to migrate to Silicon Valley - not just because that was where the *money* was, but also because that was where the *understanding* was too (Zook, 2005).

At least three important conclusions flow from Colin Mason’s seminal analysis. First, the role of geographical proximity emerges as a powerful force in both the informal and the formal sectors of venture capital activity, and this helps to explain its strong spatial bias to core cities and regions in Europe and North America. Second, local clustering is not the whole story here because long distance investments are also occurring, though these tend to be conducted through syndicates in which one of the partners will have some local knowledge, reinforcing the point in the preceding section on new combinations of local and non-local knowledge, both of which are essential to the venture capital learning curve. Thirdly, the policy implications of this analysis are rather disturbing because, as Mason argues, ‘using public money to create ‘venture capital’ funds which are staffed by managers who lack the value-added skills of venture capitalists will be ineffective’ (Mason, 2007). Venture capital, in other words, involves much more than just money.

Spatial ecologies of higher education

The role of higher education (HE) in supporting innovation through knowledge transfer may be widely acknowledged, but the proportion of firms that actually uses such knowledge directly tends to be limited (Lambert, 2003; DTI 2004). As such there has been a strong state-led push to strengthen ties between businesses and HE institutions located within the same region in order to stimulate regional economic development. Yet, for academics themselves, the drive to harness their knowledge to stimulate regional economic development is not necessarily of great personal interest, not even for those engaged in commercially-relevant research. Studies demonstrate that factors such as personal recognition, personal interest and a desire to 'make a difference' in personally defined areas of interest are far more significant influences over the pattern of knowledge exchange and engagement in exercises of collective learning (Upton 2009). Whilst in some cases these might provide economic benefits at the firm-level, it is a large leap to extend this to the economy as a whole.

In this regard, the concept of the learning region has, we argue, become overly associated with narrowly conceived models of territorial innovation (Moulaert and Sekia 2003, Rutten and Boekema 2007). Not only do academics themselves not fit neatly within this model, it also risks undervaluing other forms of knowledge which are developed within the HE sector through research relating to social or environmental welfare and other goals of societal development. Much of this knowledge is strongly beneficial to social well-being and is subject to strong dissemination activity. This may include public seminars by academics around health issues designed to both inform the public and to involve the public in setting future research agendas (Upton 2009) – the very essence of a reflexive institution – or, more emphatically, the role of academic research in informing the global debate on climate change (IPCC 2007). Within a region this knowledge can also be harnessed to inform public policy and to seek to develop new solutions to pressing public policy issues, a role which is no less significant, and spatially-bounded, than the competitiveness and innovation agenda which is traditionally espoused in the learning regions literature.

The HE sector also provides a rich vein of evidence as to the importance of relational forms of proximity in the exchange of knowledge for purposes of economic or social innovation. The evidence suggests that it is the nature and range of *personal networks* which is the crucial factor in determining the spatial dimensions of the learning space (Healy forthcoming). Whilst geographical proximity can assist in this process, it is not a given. In fact the evidence suggests that, within almost any defined space, strong silos of activity exist, separating businesses, public sector bodies and the HE sector, and the individuals located within these three sectors (Healy 2009). These silos exist both within organisations and between organisations. This is manifested in a limited awareness of those responsible for regional economic development activities of the actions of research programmes within their region; but also in a compartmentalisation of knowledge within public bodies and individual HE institutions. In the case of the HE sector and regional economic development, distinctive, albeit overlapping, communities of practice can be identified but rather than enhancing learning opportunities these relational communities can also act to divide and limit opportunities for learning within a region. It seems that Gertler's observation that "deterrents to effective distanced learning are both logistical and institutional in nature" (2008:2) can equally be applied to learning in the context of geographical proximity. It also seems that there is much truth in the assertion that relationships do not exist automatically within a region but have to be constructed (Morgan 2004a). This reinforces our earlier review of the empirical evidence base, which suggests that geographical proximity is only effective if social, institutional, cognitive and cultural forms of proximity are also present (Boschma, 2005). In practice, the process of collective learning is neither local nor distanced, but a complex amalgam of each.

Evidence from knowledge exchange activity by the HE sector might be read to suggest that the emphasis on intra-regional learning in the learning regions literature may overshadow other important learning spaces. In practice, one of the crucial roles that the HE sector plays is to act as a conduit for *inter-regional learning* (Benneworth and Hospers 2007, Hassink and Lagendijk 2001). In their thoughtful analysis, Hassink and Lagendijk (2001) argue that the focus of research exploring notions of the learning region on single regions has led to the neglect of *inter-regional* dimensions of learning. Unfortunately, the process through which inter-regional knowledge generation is transformed into intra-regional learning remains something of a black box. Whilst it is undoubtedly true that the HE sector is able to generate learning collaborations at different spatial scales with different actors, thus acting as a ‘pipeline’ of knowledge into a region, there is limited evidence of the knowledge from international research being directly turned into local learning (Healy 2009).

Despite the emerging empirical evidence on the role of social filters and associational activity in stimulating economic growth through learning effects, the *means* by which this occurs at a regional level remains hazy to say the least.

4. The ecological turn: learning, innovation and sustainable development

To this point we have discussed innovation in the conventional context in which it is normally addressed. However, this context is increasingly perceived to be too narrow, in both sectoral and normative terms, to address the challenges of learning and innovation in the age of climate change. A broader analytical lens will therefore be needed to explore these issues because, with *the ecological turn*, societies are increasingly asking themselves how innovation in the broadest sense – social as well as economic, public as well as private sector - can contribute to the pressing need for more *sustainable* forms of development. A growing body of opinion is also coming to the conclusion that the indicators of development have been geared to an inordinately narrow economic metric, a metric that tends to conflate what is instrumentally significant (like innovation) with what is intrinsically significant (like sustainable development and well-being), a conflation of means and ends (Morgan, 2004b; Pike et al, 2006; Bristow, 2009; Sayer, 2010).

Having taken a retrospective perspective in previous sections, this section uses the notion of ‘the ecological turn’ to speculate about future trajectories of learning and innovation. Three dimensions of the ecological turn merit attention because they suggest that new spaces of innovation – be they territorial or relational spaces – will have to negotiate threats and opportunities that are quite unprecedented. Let us briefly elaborate on each of them:

Sustainability as a new developmental meta-narrative: though it is sometimes equated with the drive for a low carbon economy, this meta-narrative is much more multi-dimensional, embracing society and its consumption patterns as well as the productive economy. Driven by the burgeoning climate change crisis, this meta-narrative speaks to *ends* as well as means and it freely concedes that human values - normativity – are an intrinsic feature of development even though positivists like to pretend otherwise. This meta-narrative is finally moving into the political mainstream, where radically new global targets to cut greenhouse gases (GhG) will create a more demanding regulatory environment for all firms, creating new opportunities for *eco-innovation*. This meta-narrative also demands a new geographical imaginary because, in ecological terms, conventional notions of proximity have been rendered obsolete by the inescapable fact that GhG emissions have a global effect whatever their local source. The international response to climate change has begun to steer large swathes of public and

private investment into more sustainable sectors and greener technologies, though new technical solutions will need to be calibrated with new behavioural patterns, raising more critical questions about the nature of growth, development and well being at every spatial scale.

Systems of eco-innovation: the models of innovation that have dominated the literature over the past 30 years include the linear model, the interactive model and, most recently, the open model (Chesbrough, 2003). Despite their differences, what all these models have in common is that they are all inordinately focused on the firm. With the ecological turn, however, there is a shift away from firm-level processes to a broader focus on the role of ‘socio-technical regimes’. This new focus recognises that firms and technologies are embedded in wider social and economic systems and these are defined by the overarching structures of markets, patterns of final consumer demand, regulatory systems and infrastructures that reinforce path dependent behaviour (Berkout, 2002; Smith, et al, 2005). Socio-technical regimes play a major role in the sectors that are most deeply implicated in climate change, like energy, transport, the built environment and agri-food for example. Particularly in these ecologically sensitive sectors, the innovative firm has to engage not just with other firms, as in the open model, but with a wide array of other parties, including state bodies and NGOs. In these key sectors the levels of risk and uncertainty are so immense that systems innovation is unlikely to occur without the state playing a much more active role as co-producer, especially with respect to finance, regulation and public procurement.

Return of the State: while the climate change crisis signalled the ‘return of the state’ long before the credit crunch crisis, the latter served to reinforce the trend, creating a new political dynamic in which the ideological credentials of the state have been enhanced vis-à-vis those of the market. Only the state has the capacity to mobilise sufficient resources, financial and organizational, to counter the twin threats of climate change and credit crunch. Far from being a monolithic entity, ‘the state’ is now part of an elaborate system of multi-level governance, straddling international, national and sub-national realms. While the climate change crisis is being addressed at the international level under the auspices of the UN, the credit crisis has induced ad hoc national responses. This is the multi-level context in which sub-national actors like local and regional governments have to design their strategies for innovation and development. The scope for unilateral action at the sub-national scale may be extremely modest, but it is not unimportant. On the contrary, a whole series of eco-innovations are being trialled at the sub-national level all over the world, including:

- new solar energy technology in Austin, Texas
- carbon capture and storage in New Haven, West Virginia
- clean technology in general in California
- renewable energy in the home in Marburg, Germany
- urban congestion charging in London and Stockholm
- urban food security in Belo Horizonte, Brazil
- peasant-owned food cooperatives in Henan Province, China
- zero emission buses in Helsinki, Finland (Morgan, 2008).

In such cases it is not too much of an exaggeration to say that these cities and regions are acting like local laboratories of learning and innovation – localised spaces of eco-innovation in effect. Where these localized and collective learning experiments are successful, they can be scaled up and diffused nationally and internationally. What this assumes, of course, is that the multi-level governance system is capable of pursuing a ‘joined-up’ strategy for innovation and development, so that local

experiments are fostered by national regulations. All too often, however, the local experiment is way ahead of the national state, and this stymies the force of localised experimentation. This begs the question as to whether the ‘return of the state’ signals the return of a competent state, a state that has the skill sets, the reflexivity and the organizational capacity to rise to the challenges – of sustainability, innovation and governance - outlined above. Or is it the case, as Boschma (2009) implies, that *public* institutions are just as prone as private firms to the dull constraints of routines, sunk costs and path dependency?

While ‘the ecological turn’ creates new threats and opportunities for all regions, it is especially challenging for less favoured regions (LFRs), which tend to be over-dependent on the public sector because the private sector is invariably weak or under-developed. However, is it really feasible to expect the public sector to become a more innovative, more reflexive actor that can help LFRs to engage in more collective learning processes? This would involve an important shift in the ethos and function of regional governance in LFRs – away from traditional administrative/regulatory roles towards a more enabling/facilitative state. While this involves new skill sets for the state, such a shift is long overdue because no other actor seems capable of breaking the path dependent nature of development in the LFRs, where there tends to be a lack of dynamic collaboration.

In a new twist on the old adage of ‘who dares wins’, Lorenzon argues that ‘the public sector can be the first agent that dares to cooperate, in order to set off a cumulative process of institutional learning’ (Lorenzon, 2007:223). In practice, however, this poses a profound challenge for LFRs because of the paradox of peripherality – which suggests that the forces of path dependency are most pronounced in the areas where new trajectories are most needed.

5. Conclusions

Notwithstanding the valid criticisms that have been levelled at it, the concept of the learning region is not without merit. Most important, in our view, is the fact that it triggered a useful debate in economic geography about the spatialities of learning and innovation. If the concept is to have any traction in the future, however, it will need to engage with at least three key issues.

First, we need a better *understanding of proximity* in all its forms. In particular, we need to better understand the scope of/limits to geographical proximity as a mode of learning and how it competes with or complements other forms of relational proximity, including temporal geographical proximity (Torre, 2008). The proposition that learning regions are not wholly bounded spaces and that non-local ties are also very important for learning is hard to refute. Yet, in itself this does not devalue the role of the regional space as a place which shapes the efficiency and effectiveness of the learning process. For many authors, the importance of tacit knowledge and physical interaction in the learning process reinforces the importance of co-location because “such interaction works best when users and producers are proximate” (Gertler 2008:10), and something gets ‘lost’ when we communicate at a distance (Morgan 2004a). Similarly, the weight of evidence as to the spatial limits to knowledge spillovers would seem to confirm the significance of geographical proximity to the theory and practice of innovation.

To acknowledge the stickiness of knowledge, however, should not lead us to underestimate the importance of external knowledge flows, as empirically demonstrated by Rodriguez-Pose and Crescenzi (2008a). No region can be self-sufficient in the generation of knowledge and the relational attributes of knowledge flows, and how they are assimilated within a region, are an important component in any consideration of a ‘learning region’. Certainly, individual regions value the

potential opportunity to import knowledge by seeking to explicitly strengthen the local knowledge infrastructure. In practice, however, the focus of research on particular individual regions has meant that the *inter-regional* dimensions of learning remain underexplored (Hassink and Lagendijk 2001), leaving a fruitful research agenda for the future.

Second, *social and ecological innovation* will need to feature more prominently in our conceptions of innovation in the future - and learning regions could play an important role here, particularly with respect to regional experimentation, where new policies and practices are learned and unlearned. If our interpretation of the ecological turn is correct, both the state and civil society will become more deeply implicated in the innovation processes of the future, implying that technological innovation will depend on a wider set of actors than ever before, not least because the state will become ever more involved in “system innovation” and because low carbon innovations will be both cause and consequence of new, more sustainable lifestyles.

Third, we need a finer appreciation of *territorial governance systems*. A key question here is the extent to which territorial governance bodies can become reflexive facilitators in the regional learning process. This requires an important shift in governance functions away from traditional administrative-regulatory roles towards a more enabling and facilitative role, one that can act as a node for distilling valuable lessons of what works, where and why, so as to nurture associational activity and collective learning processes. Or is this too much to expect? Critics will say, not without reason, that the public sector is too risk averse to learn lessons for itself, thereby rendering it unfit to act as an interlocutor for others. However, with the ‘return of the state’ there will be more and more pressure for the public sector to innovate within its own institutions, especially in the context of less favoured regions, which tend to be the most state-centric areas. Because it stresses the power of routines in development, a key question for evolutionary economic geography is whether state actors in LFRs can transcend the dull constraints of path dependency and overcome the paradox of peripherality.

After more than a decade and a half of research it does seem that geographical proximity (and so territorial space) remains important to learning (and to the exploitation of the resultant knowledge). The evidence suggests that it is within the territorial space that knowledge (from near and far) is combined most effectively, but only if robust network relations are in place. The challenge for policy-makers is what happens if those network relations are not present, either internally for the spread of knowledge or externally for the influx of knowledge? Learning regions clearly need to be more than the sum of their parts, but how are the parts best integrated? In the context of less favoured regions in particular, there is clearly a role here for the public sector to act as a more robust facilitator of knowledge networks. One of the key questions for future research is whether the public sector can acquire the competence and the confidence to play such a demanding role.

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